



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2018; 7(4): 381-383

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www.thepharmajournal.com

Received: 20-02-2018

Accepted: 21-03-2018

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Effect of drip irrigation and mulching on growth of cashew

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Abstract

An experiment was conducted to assess the Effect of drip irrigation and mulching on growth of cashew nut envisaged to evaluate the scheduling of irrigation at different pan co-efficient (e pan) in combination with different mulching method in private cashew orchard at Arjunpur, Khurdha in 2015-16. Experimental comprised of 192 number of grafted planted c.v. Venggrula-4 at the 3rd year at spacing of 7m X 7m. Taking into account the scheduling of irrigation at different levels of E pan and kinds of mulching material used in six treatment combination. I1M1-No irrigation + No mulching (control), I1M2- No irrigation + Paddy straw mulch, I1M3- No irrigation + Green leaf mulch, I1M4- No irrigation + LDPE mulch. I2M1- Irrigation at 0.6 E pan + No mulch, I2M2- Irrigation at 0.6 E pan + Paddy straw mulch, I2M3- - Irrigation at 0.6 E pan + Green leaf mulch, I2M4- Irrigation at 0.6 E pan + LDPE mulch. I3M1- Irrigation at 0.8 E pan + No mulch, I3M2- - Irrigation at 0.8 E pan + Paddy straw mulch, I3M3- Irrigation at 0.8 E pan + Green leaf mulch, I3M4-- Irrigation at 0.8 E pan + LDPE mulch The study revealed that the plant height in both seasonal observation attained under the drip irrigation scheduled at 1.0E pan i.e. fulfilling 100% water requirement of the plant per days as calculated but mulching alone expressed no significant effect on plant height and in combination of irrigation at 1.0E pan along with LDPE mulching the result became conspicuous with highest plant height

Keywords: Drip irrigation, mulching, growth, cashew

Introduction

The cashew (*Anacardium occidentale* L.) belongs to the family Anacardiaceae, has been described as a small to medium sized tree found in Northern part of South America which was originated from Brazil. It was introduced from Brazil to India by the Portuguese missionaries in the 16th century, to cover bare hills and for soil conservation. India also ranks as the largest (90%) exporter of cashew kernels in the world. However, production of raw cashew nut in the country is far below the requirement of the processing sector, necessitating therefore the import of raw cashew nuts. It offers pleasant and palatable kernels which are used either in raw or value added from both confectionary and dessert purpose. The kernel contain 21% vegetable protein, Fat of 47 % where 82 % fatty acids in unsaturated form which lower blood cholesterol. Water stress during critical stages of fruit growth and development is the main reason for low productivity in cashew growing areas, owing to sloppy land topography and poor water holding capacity of the soil. So water management during the period of the fruit set to maturity plays an important role in improving the yield resulted as drip irrigation came as solution in that particular area in low rain fall areas, mulching around the base of the tree help in controlling weed, retention of moisture and modulation of soil temperature.

The study on cashew indicated that better plant growth, more number of perfect flower per panicle and enhancement in the yield can be achieved under drip irrigation with plastic mulch. Basing on the above fact and findings, the present investigation was carried out on effect of drip irrigation and mulching on growth of cashew.

Materials and methods

The present investigation entitled "Effect of drip irrigation and mulching on growth of cashew nut" envisaged to evaluate the scheduling of irrigation at different pan co-efficient (e pan) in combination with different mulching method. Experiment was carried out in private cashew orchard at Arjunpur, Khurdha. Experimental comprised of 192 number of grafted planted c.v. Venggrula-4 at the 3rd year at spacing of 7m X 7m. All plants were given similar cultural treatments except irrigation and mulching. A fertilizer dose of 250gm N, 125gm P and K was uniformly applied in ring along the drip line.

Different kind of mulching material were used during the field experimentation. The locally available mulching material like paddy straw and green foliage were used in some treatment where as black Linear density Poly Ethylene (LDPE) mulch of 100 micron thickness was used in others. No mulching material was used in the control plants. There were four levels of irrigation as main plot and four kinds of mulching in the sub plot together constituting sixteen treatment combinations with three replication under factorial randomized block design. Taking into account the scheduling of irrigation at different levels of E pan and kinds of mulching material used in the treatment combination.

I1M1- No irrigation + No mulching (control), I1M2- No irrigation + Paddy straw mulch, I1M3- No irrigation + Green leaf mulch, I1M4- No irrigation + LDPE mulch.

I2M1- Irrigation at 0.6 E pan + No mulch, I2M2- Irrigation at 0.6 E pan + Paddy straw mulch, I2M3- Irrigation at 0.6 E pan + Green leaf mulch, I2M4- Irrigation at 0.6 E pan + LDPE mulch.

I3M1- Irrigation at 0.8 E pan + No mulch, I3M2- Irrigation at 0.8 E pan + Paddy straw mulch, I3M3- Irrigation at 0.8 E pan + Green leaf mulch, I3M4- Irrigation at 0.8 E pan + LDPE mulch

I4M1- Irrigation at 1.0 E pan + No mulch, I4M2- Irrigation at 1.0 E pan + Paddy straw mulch, I4M3- Irrigation at 1.0 E pan + Green leaf mulch, I4M4- Irrigation at 1.0 E pan + LDPE mulch.

The time of drip operation was determined by the total quantity of water required in litre divided by the total discharge rate.

The different biometrical as well as growth attributing characters were observed by taking observation, height was measured from the base of the plant up to the apex of the top most shoot and expressed in centimetre and girth was taken 15 cm above the ground level by measuring the circumference of the trunk with a meter tape and expressed in centimetre. Canopy spread of the plant in all direction (East- West and North - South) was measured separately by a graduated pole and averaged out and expressed in centimetre. Number of laterals per square meter frame was taken and applied on four different location on the canopy in each direction selected at

random. Number of lateral inside the frame was calculated each time and average was recorded.

For each character analysis of variance was carried out with mean values of each cashew types under each replication of positioning total variance in components as replication cashew types and error. Using Correlation coefficient formula was taken for correlation between different characters by taking the variance and co-variances for the individual characters.

Results

The different vegetative growth parameters such as Plant height, Plant girth, canopy spread in both direction and number of lateral per square meter were presented. The data were statistically analysed to test the significance. The sole effect of irrigation at 1.0E pan caused the highest plant height of 187.33 cm, 231.61cm and 284.66 cm in the month of June followed by that obtained from the treatment receiving irrigation at 0.8 E pan and 0.6 E pan. Effect of mulching is concerned in the initial year, mulching did not show any significant result on the plant height but subsequent observation LDPE mulching is the best, also combination of treatment LDPE mulch with irrigation at 1.0 E pan yield significantly higher effect on plant height (235.35 and 270.30 cm). The plant girth attained highest circumference (21.40 and 25.76 cm) under the irrigation at 1.0 E pan where mulching method have not so conspicuous result but interaction effect is concerned the LDPE mulch along with the irrigation at 1.0 E pan resulted highest plant girth (21.72 and 26.008 cm). Different irrigation regimes resulted better canopy spread than the control in order of superiority as 1.0E pan > 0.8E pan > 0.6E pan, as regards mulching effect is LDPE > paddy straw > green leaf > no mulch in each and every year. In interaction effect of LDPE mulch in combination with irrigation at 1.0E pan resulted significantly highest canopy spread in East – West direction (178.96 and 205.00cm) and North – South direction was (193.7 and 254.7cm). Every year highest number of laterals per square meter found in the treatment of 1.0 E pan and LDPE mulching and combination of 1.0e pan and LDPE mulching.

Period Treatments	plant height (cm)				plant girth (cm)				Canopy spread(E-W)				Canopy spread (N-S)				No of laterals per square meter	
	2015		2016		2015		2016		2015		2016		2015		2016		2015	2016
	April	Dec	April	Dec	April	Dec	April	Dec	April	Dec	April	Dec	April	Dec	April	Dec		
I1M1	208.73	235.93	243.53	268.63	18.10	21.97	22.30	26.53	146.63	169.50	179.50	201.47	153.12	168.21	186.12	190.24	15.07	17.67
I1M2	209.73	236.17	246.83	268.70	18.27	22.10	22.97	25.37	147.33	170.03	182.07	201.27	155.03	171.32	185.23	192.2	15.40	18.80
I1M3	210.70	237.27	244.67	271.37	18.53	22.33	23.00	25.30	148.43	170.80	182.17	202.87	157.21	194.01	187.12	191.03	15.60	18.53
I1M4	211.07	236.63	250.60	271.33	19.03	22.40	23.47	25.63	150.50	172.83	185.10	203.83	158.002	195.21	187.42	212.11	16.10	19.27
I2M1	217.87	242.57	253.27	292.43	20.47	24.50	25.07	26.63	161.50	184.90	200.20	215.83	183.21	197.12	213.33	223.12	26.90	30.40
I2M2	217.93	243.53	253.30	293.27	20.23	23.70	24.27	27.03	162.30	186.80	201.77	218.30	184.14	198.13	214.21	224.32	27.33	30.67
I2M3	218.63	243.97	253.67	292.33	20.30	24.77	24.67	28.37	163.60	187.57	203.27	218.33	184.04	214.21	215.13	226.23	27.12	31.13
I2M4	218.97	243.33	260.37	292.47	20.27	24.30	24.83	28.33	165.50	191.47	203.97	219.60	186.13	213.22	217.32	229.02	29.13	30.40
I3M1	227.27	253.40	262.87	302.87	20.27	24.63	25.37	29.33	168.53	195.80	206.63	223.57	206.11	214.04	221.04	230.12	34.40	36.40
I3M2	227.67	254.07	265.03	303.70	20.27	24.47	25.53	29.47	170.63	198.53	208.23	223.67	206.31	215.12	222.11	232.11	34.13	37.50
I3M3	228.33	256.97	267.83	304.23	20.30	24.80	25.57	30.07	171.57	199.80	209.30	224.83	207.12	216.23	221.22	232.23	34.60	37.80
I3M4	229.10	255.90	274.13	304.53	20.43	24.53	25.53	30.47	171.43	200.97	210.67	225.13	208.11	218.14	224.41	236.13	34.33	38.40
I4M1	230.70	274.00	284.33	314.57	20.80	25.57	26.07	30.93	185.03	206.27	220.37	234.50	216.21	220.11	228.03	237.02	36.47	42.13
I4M2	231.00	275.17	284.93	315.57	20.73	25.47	26.00	31.37	186.13	207.57	220.93	234.77	216.42	221.23	229.04	237.14	36.51	42.40
I4M3	231.97	275.60	285.07	317.00	20.53	25.37	25.83	31.50	186.47	208.60	221.23	236.27	217.41	221.23	230.12	239.01	37.62	41.87
I4M4	232.77	275.17	285.10	316.80	21.10	26.03	26.67	32.07	187.60	209.67	222.00	238.17	218.04	226.23	231.32	239.41	38.20	42.40
±SE(m)	0.322	0.443	1.975	0.509	0.153	0.227	0.228	0.458	0.278	0.263	0.413	0.0007	0.0007	0.0007	0.007	0.069	0.141	0.151
CD (0.05%)	0.964	1.328	5.925	1.525	0.457	0.683	0.684	1.375	0.833	0.790	1.123	0.020	0.017	00.019	0.020	0.207	0.422	0.454

Discussion

While discussing the vegetative character of a plant, the height, girth and canopy spread together constituting its phenotypic expression bears much importance. In the present experiments it is revealed that, the plant height in both seasonal observation attained under the drip irrigation scheduled at 1.0E pan i.e. fulfilling 100% water requirement of the plant per days as calculated but mulching alone expressed no significant effect on plant height.

In combination of irrigation at 1.0E pan along with LDPE mulching the result became conspicuous with highest plant height, it's probably due to availability of adequate moisture for plant growth even at the drier period of the year. A continuous supply of soil moisture to meet the evaporative demand of the crop resulted higher plant height than the control treatment where no irrigation was provided. (Blaike *et al.*, 2001) ^[4]. This corroborates the findings of The plants irrigated at 1.0E pan level with LDPE mulch attain highest plant girth in comparison to other mulching methods due to higher rate of photosynthesis in irrigated plants than non-irrigated ones due to water supply at a constant rate during dry periods. By the maintained of soil moisture at optimum level eliminating water stress to the plants greater vigour was achieved.

The present investigation envisaged that the canopy spread in both east-west as well as north-south direction was highest in the treatment receiving irrigation at 1.0E pan with LDPE mulching due to drip irrigation at frequent intervals which provided a consistent moisture regime in the soil resulting the plants roots to be remained active for a long period. The proper and continuous moisture supply from the soil also increased the availability of nutrients and translocation of food materials which accelerated the vegetative growth of cashew plants grown under irrigated condition. This was observed by in pomegranate in Aonla and guava.

As observed from the recorded data, highest number of laterals shoots per square meter of canopy area were observed in the treatment combination of irrigation at 1.0E pan and LDPE mulch. This is similar findings of in Citrus; Dixit, A. (2003) ^[6] in mango.

Summary and conclusion

From the above investigation it was concluded that treatment combination of irrigation at 1.0 E pan and black LDPE mulching gave significant result on the vegetative growth of the plant *i.e.* plant height, trunk girth, canopy spread and number of lateral shoots per square meter of canopy area which was at par with irrigation scheduled at 0.8E pan with LDPE mulch due to consistent supply of moisture as par the requirement of the plant and its effective conservation through mulching.

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